Structures, Processes, and Responses of Plants

6-2 The student will demonstrate an understanding of structures, processes, and responses of plants that allow them to survive and reproduce. (Life Science)

6.2.7 Summarize the processes required for plant survival (including photosynthesis, respiration, and transpiration).
Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/Future knowledge: In kindergarten, 1st grade, and 3rd grade, students studied the resources needed by plants in order to survive. Students have not studied the specific processes of photosynthesis, respiration, and transpiration.

It is essential for students to know that plants are organisms that perform certain processes necessary for survival.

Photosynthesis
- Plants are organisms that make their own food, a simple sugar, for survival.
- The process by which they make this sugar is called *photosynthesis*.
- *Chloroplasts*, found in the cells of the leaf, contain *chlorophyll*, a green pigment that absorbs light energy.
- During this process, plants use carbon dioxide gas from the air (taken in through openings, or *pores*, in the leaf called *stomata*) and water (taken in through the roots) to make sugar (food) in the leaves.
- During the process of photosynthesis, oxygen is also produced. The oxygen is released into the air through the stomata.
- Photosynthesis is the process that provides the oxygen in the atmosphere that most living organisms need.

Respiration
- The food (sugar) created through the process of photosynthesis is used to provide energy needed by the plants to perform life functions.
- To obtain the energy from the food it produces, plants must break down the sugar in the cells throughout the plant in a process called *respiration*.
- In this process, oxygen from the air (taken in through the stomata) combines with the sugar, which is then broken down into carbon dioxide and water.
- During this process, energy is released. This energy can now be used by the plant to perform life functions.
- The carbon dioxide and water that are formed are then given off through the stomata in the leaves.

Transpiration
- Some of the water taken in through the roots of plants is used in the process of photosynthesis.
- However, plants lose most of the water through the leaves. This process is called *transpiration*.
- Without a way to control transpiration, plants would wither up and die. Fortunately, plants are able to slow down transpiration.
- *Guard cells*, mostly on the underside of the leaf, open and close the stomata.
- When the stomata are closed, water cannot escape from the leaf.

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It is not essential for students to know the chemical formulas for photosynthesis and respiration. The light and dark dependent reactions of photosynthesis as well as the steps for respiration are not essential. Students do not need to know the internal leaf structural layers.

Assessment Guidelines:
The objective of this indicator is to *summarize* plant processes necessary for survival; therefore, the primary focus of assessment should be to generalize the major points about the processes of photosynthesis, respiration, and transpiration. However, appropriate assessments should also require student to *identify* the component plant parts necessary for photosynthesis, respiration, and transpiration; *illustrate* the movement of water, oxygen, carbon dioxide, and food through the plant; *compare* photosynthesis and respiration in terms of starting materials and what is produced; or *recall* the function of these processes in plants.